

SHORT NOTE [NOTA CORTA]

PROTEIN AND AMINO ACID COMPOSITION OF 'HASTA LA PASTA'
SPAGHETTI SQUASCH (*Cucurbita pepo* L.)

[CONTENIDO DE PROTEÍNA Y AMINO ÁCIDOS DE LA CALABAZA
'HASTA LA PASTA' (*Cucurbita pepo* L.)]

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SUMMARY

The protein and amino acids composition of seed and pulp of Hasta La pasta were determined in which the seed has higher ($P>0.05$) amount of protein compared to pulp content. The content of the amino acids in both the sample are good source of essential and non essential amino acids with above 100 % chemical score for the seed while pulp has less than 100% with isoleucine above 100%. The results obtained could serve as useful source of low-cost protein for both human and animals food, it can also be used to minimize the protein and malnutrition problems.

Key words: Amino acids profile; protein; vegetal spaghetti.

INTRODUCTION

Protein-energy malnutrition (PEM) is also referred to as protein-calorie malnutrition. It is the leading cause of death for children in developing countries, due to the insufficient consumption of protein and energy (measured by calories) to satisfy the body's nutritional needs. PEM is serious problems in many developing countries, most commonly affected are children between the ages of 6 months and 5 years (W.H.O, 2000).

In line with this crucial problem a lot of interest has prompted an intense research in harnessing the nutrients potential of lesser wild plants in Nigeria as alternative or supplement source of food to curtail the problems of proteins and malnutrition in the affected countries (Aletor and Agbede, 2004). Some of these plants products were reported to have high protein contents, which could be used to supplement the protein intake of people through the development of new products and fortifications of various starchy staples (Enujiugha and Ayodele-Oni, 2003).

RESUMEN

Se analizó el contenido de proteína y amino ácidos de la semilla y pulpa de la calabaza 'Hasta la Pasta'. La semilla tuvo el mayor valor proteico. Se encontró que es una buena fuente de amino ácidos esenciales. El índice de la calidad del perfil de amino ácidos fue superior a 100% para la semilla e inferior a 100% para la pulpa. Los resultados sugieren que es una proteína de calidad de bajo costo para la alimentación humana y animal.

Palabras clave: Perfil de amino ácidos; proteína; espagueti vegetal.

The plant *Hasta La pasta* (vegetable spaghetti) belongs to the family of Cucurbitaceae and a genus and specie of *cucurbita pepo*. *Cucurbita pepo* are among the economically most important vegetable crops worldwide and are grown in both temperate and tropical regions (Pitrat et al., 1999). Some people eat the pulp raw while other people used it as additives in soup making.

Hasta La pasta is an oblong seed-bearing plant, which is variety of winter squash. The fruit can range either from ivory to yellow or orange in color or green with white streaks. Its center contains many large squash seeds. Its measures 25cm3 long and 12cm in diameter also each weighted 1kg, the flesh is bright yellow or orange or white for different variety. When raw, the flesh is solid and similar to other raw squash; when cooked, the flesh falls away from the fruit in ribbons or strands like conventional spaghetti (Marc Janssens et al., 2007).

Objective

The objective of this work was to evaluate the protein and amino acids composition of the seed and pulp of

Hasta La pasta cultivar and compare with some other value obtained and that of the (WHO, reference standard).

MATERIAL AND METHODS

Sample Collection: Matured fruits of *Hasta La Pasta* were purchased from Tazame village market, Tsafe local government area, Zamfara State. The fruits were identified at the taxonomy section, Botany Unit, Usmanu Danfodiyo University as *Hasta La Pasta* (Vegetable Spaghetti).

Sample Treatment: Three different fruits were washed and mopped with filter paper, peeled with stainless steel knife and seeds separated from the fruits. Both the pulp, peel and whole seed were sun dry for four days to reduce the moisture content, Pulverised to a fine powder using (pestle and mortar) and packed in a cleaned labelled bottle, prior to the commencement of the analysis.

Chemical analysis

Two grams of the sample was used to measure of nitrogen (Kjeldahl) (AOAC, 1990). Amino acids content in the samples was determined using ion exchange chromatography by Technicon Sequential multisampling Amino Acid Analyzer, adopting the method of (Hassan and Umar, 2008). Defatted sample was dried and milled into a fine powder. 30mg of the powder was weighed into a glass ampoule to which 5 cm³ of 6 M HCl and 5 moles norleucine (2-amino hexanoic acid) internal standard was added. The ampoule was evacuated by passing nitrogen gas to prevent oxidation of some amino acids during hydrolysis. The ampoule was then sealed with Bunsen burner flame stored in an oven thermostat at 110°C for 24 hours. After hydrolysis, the ampoule was cooled, broken at the tip and the content was filtered. The filtrate was then evaporated to dryness at 40°C under vacuum in a rotary evaporator. The residue was dissolved to 5µL (for acid and neutral amino acids) or 10 µL (for basic amino acids) with acetate buffer, pH 2.2. The aliquot was then loaded into cartridge of amino acid analyser. The chromatograms obtained along with automatic pen records indicate amino acids peaks corresponding to the magnitude of their respective concentrations. Quantification was performed by comparing the peak area of each amino acid in the sample to the area of the corresponding amino acid standard of the protein hydrolysate (0.02 µ mole).

RESULT AND DISCUSSION

Protein is essential constituent of all body tissues and plays a vital role in the production of new tissue during growth, wound healing and pregnancy. The

crude protein value was found to be 32.39 + 0.41% for the seed and 28.71 ± 0.04% for pulp respectively as shown in table 1. The values of seed protein content of *Hasta La pasta* cultivar are higher when compared with some other fruit of the same family such as *Citrullus lanatus* and *Cucumis melo* having the value of 29.83±1.74 and 29.55±2.09 respectively, but lower than 36.21±2.17 for *Cucumeropsis mannii* (Loukou *et al.*, 2007).

From the results it could be said that the protein content of the samples could be a promising potential foods due to the fact that, it has higher protein content than some of its family members, for that, the plant could be used to augment the critical protein shortage especially in countries with this problem (PEM) to which Nigeria is included. Amino acids profile:

There are about twenty different amino type amino acids that constitute the protein in food substances (Hassan and Umar, 2008); these include both the essential and non-essential amino acids. In this study, only seventeen of these acids are detected due to the conversion of glutamine and asparagines to glutamic and aspartic acids respectively and complete destruction of tryptophan during acid hydrolysis (Hassan and Umar, 2008).

The results of the amino acid compositions as shown in Table 1 indicate that the seed contents, contain almost all the essential amino acids needed, with lysine and threonine as limiting amino acids while in the pulp only isoleucine is found in an adequate amount.

Table 1. Amino acids composition of *Hasta La pasta* (mg/100g protein).

Amino acid	Seeds	Pulp
Protein	32 ± 0.37	28.71 ± 0.04
Alanine	3.25	2.34
Arginine	6.68	4.24
Aspartic acid	8.75	4.62
Cysteine	1.68	0.56
Glutamic acid	13.10	5.34
Glycine	4.21	0.41
Histidine	2.29	1.33
Isoleucine	3.69	3.18
Leucine	6.86	4.98
Lysine	4.58	3.11
Methionine	1.05	0.72
Phenylalanine	3.70	3.13
Proline	2.18	1.28
Serine	2.36	2.33
Threonine	2.20	2.12
Tyrosine	3.04	0.34
Valine	3.86	3.02

Therefore in comparisons with other values, the serine content in the seed is comparable to that reported for *Ceiba pentandra* (Hassan *et al.*, 2006). While arginine is comparable to reported content for *Parkia biglobosa* seeds (Hassan and Umar, 2005) and *Lagenaria siceraria* (Hassan *et al.*, 2008). Higher arginine value was also reported in *Ceiba pentandra* seed (Hassan *et al.*, 2006) and *L. siceraria* seeds (Hassan *et al.*, 2006). The pulp contents of *Hasta La pasta* are generally higher when compared to their corresponding value reported for *P. biglobosa* (Hassan and Umar, 2005) (Figure 1).

Cystine, methionine, phenylalanine, alanine, arginine, aspartic acids and serine are comparable to their corresponding value for *P. biglobosa* (Hassan and Umar, 2005), while the rest are lower than reported value for *P. biglobosa* (Hassan and Umar, 2005). As shown in comparative amino acid in table 2. The nutritive value of the plants protein quality are usually assessed by comparing it essential amino acids content with reference standard ideal protein set by the World Health Organisation (FAO/WHO/UNU, 1991), which is based on the amino acids need for the children aged 2- 5 years.

Therefore results showed that the seed contain almost all the essential amino acids needs, with above 100% chemical score, while the pulp however is poor source of protein but only a good source of isoleucine and all others are in limited amount with sulphur containing amino acids as the most limiting amino acids, therefore the pulp has a chemical score of less than

100%, but still contribute to a large percentage of total body requirement for isoleucine.

However in comparison with the reference standard for ideal protein the value for Methionine + Cystine, and Isoleucine contents of *Hasta La Pasta* seeds were below the recommended amino acids requirements (4.6g/100g protein) for infants, but is adequate for both pre-school children between the age of 2 –5 years, school children between the age of 10 – 12 years and the adults (Thangadurai, 2005). Likewise leucine contents are adequate for both infants, pre-school children between the age of 2 –5 years, school children between the age of 10 - 12 years and the adults (Thangadurai, 2005). These amino acids were found to be higher than 1.9g/100g protein set as reference standard (FAO/WHO/UNU, 1991) which implied that the amino acids composition, in the seed and pulp of *Hasta La pasta* has a high biological value and could contribute in meeting the human requirements for these essential amino acids.

CONCLUSION

Based on the findings, the seed and pulp of *Hasta La pasta* fruits could be a very good source of protein and can use to supplement the protein intake in people with protein- energy malnutrition in developing countries in which Nigeria is not excluded. Toxicological studies and fatty acids analysis of the plant should be carried out in order to be certain for its uses as food supplements and baby formulations.

Table 2. Comparison of essential amino acids composition of the seeds and pulp with FAO/WHO/UNU reference value.

Amino acid	Composition (mg/100gprotein)		FAO/WHO/UNU reference value*	Chemical score	
	Seed	Pulp		Seed	Pulp
Isoleucine	3.69	3.18	2.8	132	114
Leucine	6.86	4.98	6.6	104	75
Lysine	4.38	3.11	5.8	76	54
Methionine + Cysteine	2.73	1.28	2.5	144	51
Phenylalanine + Tyrosine	6.74	3.47	6.3	107	55
Threonine	2.20	2.12	3.4	65	62
Valine	3.86	3.02	3.5	110	86

* Source: FAO/WH/UNU (1991).

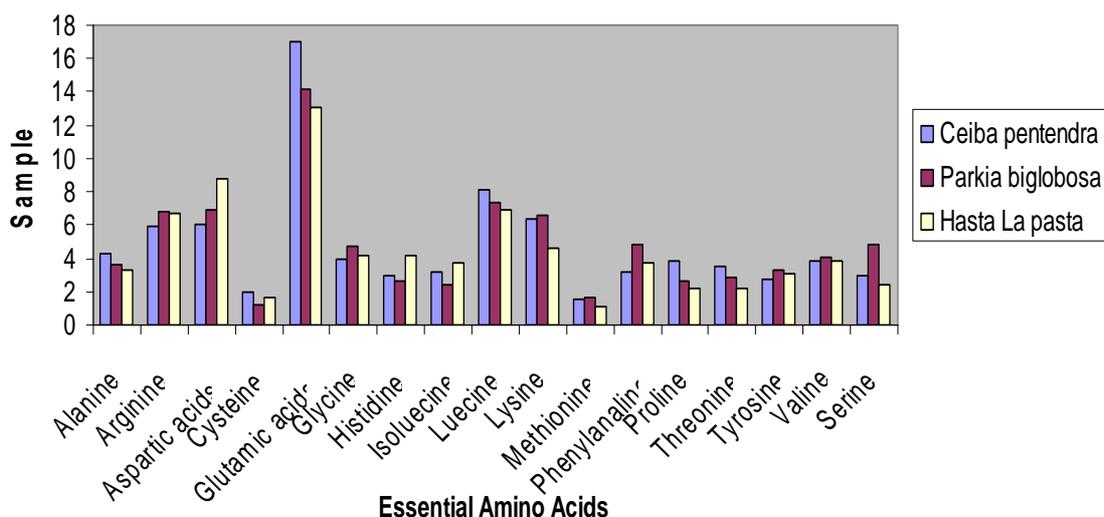


Figure 2. Comparative amino acids of Hasta La Pasta, *Parkia biglobosa* and *Ceiba pentendra*.

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